

1 **CLAIMS**

2 What is claimed is:

3 1. A method to detect dead zones in a wireless network,
4 said network having a plurality of users being
5 interconnected within the wireless network, said method
6 comprising:

7 a first user communicating via said wireless network,

8 the first user measuring and detecting a message error
9 rate while communicating,

10 said first user broadcasting an error message to a base
11 station when the error rate exceeds an error threshold
12 level,

13 said base station obtaining a location of the first user,

14 said base station incorporating the location in a
15 database of dead zones for the wireless network.

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16 2. A method as recited in claim 1, wherein each of a
17 subset of the users has a mobile unit forming a mobile
18 user connection with the wireless network

19 3. A method as recited in claim 1, wherein the wireless
20 network includes a plurality of cellular phones.

21 4. A method as recited in claim 1, wherein the wireless
22 network includes a plurality of portable computing
23 devices interconnected via a wireless local area network.

24 5. A method as recited in claim 1, further comprising a
25 step of deploying a subset of the users within at least
26 one building.

27 6. A method as recited in claim 5, further comprising
28 the step of forming a map of dead zones in said building.

29 7. A method as recited in claim 1, wherein the step of
30 error detecting includes cyclic error detection.

31 8. A method as recited in claim 1, wherein the step of
32 error detecting includes performing parity checking.

33 9. A method as recited in claim 1, wherein the step of
34 error detecting includes performing a checksum
35 calculation.

36 10. A method as recited in claim 1, wherein the error
37 threshold level is one part in a million.

38 11. A method as recited in claim 1, wherein the error
39 threshold level guarantees clear reception of data.

40 12. A method as recited in claim 1, wherein said step of
41 broadcasting uses a signal having a high probability of
42 reception by the base station in a dead zone.

43 13. A method as recited in claim 12, wherein the step of
44 broadcasting the error message is performed at twice the
45 power level used in normal message transmission.

46 14. A method as recited in claim 1, wherein the step of
47 broadcasting employs a different transmission channel
48 having a greater probability of reception than an
49 original channel employed by the step of measuring.

50 15. A method as recited in claim 1, wherein the step of
51 broadcasting is performed at a lower data rate than a
52 first data rate employed by step of measuring.

53 16. A method as recited in claim 1, further comprising
54 the step of replicating the database at at least one
55 other base station.

56 17. A method as recited in claim 1, further comprising
57 the step of replicating the database at at least one
58 other network device.

59 18. A method as recited in claim 1, wherein the step of
60 obtaining includes rotating a direction of at least one
61 antenna.

62 19. A method as recited in claim 18, wherein the step of
63 obtaining employs triangulation.

64 20. A method as recited in claim 18, wherein the step of
65 obtaining includes employing a wired LAN connecting
66 multiple base stations.

67 21. A method as recited in claim 1, further comprising:

68 said first user entering an error transmit mode;

69 said base station issuing at acknowledge to the first
70 user; and

71 said first user ending the error transmit mode.

72 22. A method as recited in claim 1, further comprising,
73 said first user entering an error transmit mode, and
74 wherein the step of broadcasting is repeated a fixed
75 number of times, and said first user ending the error
76 transmit mode.

77 23. A method as recited in claim 1, further comprising,
78 said first user entering an error transmit mode, and
79 wherein the step of broadcasting is repeated over a fixed
80 time interval, and said first user ending the error
81 transmit mode.

82 24. A method as recited in claim 1, further comprising
83 the step of logging the error message and location, and
84 the step of broadcasting is delayed for transmittal to
85 the base station at a later time.

86 25. A method as recited in claim 1, further comprising
87 the step of extracting data from a plurality of error
88 messages, and storing the data in the database for future
89 retrieval and/or manipulation.

90 26. A method as recited in claim 1, wherein the database
91 is resident at a network management station.

92 27. A method as recited in claim 25, further comprising
93 the step of forming a database of error reports, and
94 extracting a set of features from the database.

95 28. A method as recited in claim 27, wherein said step
96 of extracting includes determining a level of service
97 provided by the mobile network to at least the first
98 user.

99 29. A method as recited in claim 27, further comprising
100 the step of processing the database to determine an
101 occurrence of a repetitive time dependent feature.

102 30. A method for a particular member from a plurality of
103 members to report an error in a mobile network, said
104 method comprising:

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105 the particular member keeping track of a number of
106 errored packets occurring in a packet window;

107 the particular member entering an error transmit
108 reporting mode and reporting an error condition to a base
109 station when the number of errored packets exceeds an
110 error threshold; and

111 said base station obtaining the location of the member.

112 31. A method as recited in claim 30, wherein the step of
113 reporting includes reporting a time of error occurrence.

114 32. A method as recited in claim 30, wherein the step of
115 reporting includes providing an identity of the member
116 when the error occurred.

117 33. A method to detect dead zones in a wireless network
118 employed in an outdoor environment, said network having a
119 plurality of users and a plurality of base stations being
120 interconnected within the wireless network, said method
121 comprising:

122 a first user communicating via said wireless network,

123 the first user measuring and detecting a message error
124 rate while communicating,

125 said first user broadcasting an error message to one of
126 the base stations when the error rate exceeds an error
127 threshold level,

128 obtaining a location of the first user, and

129 said one base station incorporating the location in a
130 database of dead zones for the wireless network.

131 34. A method as recited in claim 33 wherein the step of
132 obtaining includes employing a Global Positioning System
133 (GPS) module.

134 35. A method as recited in claim 33 wherein the step of
135 obtaining includes employing a Loran-C positioning system
136 module.

137 36. A method as recited in claim 33, wherein each of a
138 subset of the users has a mobile unit forming a mobile
139 user connection with the wireless network.

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140 37. A method as recited in claim 33, wherein the
141 wireless network includes a plurality of cellular phones.

142 38. A method as recited in claim 34, wherein a GPS
143 module is built into a vehicle interconnected with the
144 wireless network.

145 39. A method as recited in claim 33, wherein a subset of
146 the users includes a plurality of vehicles interconnected
147 via a wireless wide area network.

148 40. A method as recited in claim 33, further comprising
149 a step of deploying a subset of the users within at least
150 one building.

151 41. A method as recited in claim 33, wherein the error
152 mobile network includes a plurality of members, said
153 method further comprising:

154 at least one of said members keeping track of a number of
155 errored packets in a packet window;

156 entering an error transmit reporting mode when the number
157 of errored packets exceeds an error threshold; and

158 reporting an error condition to one of the base stations;
159 and wherein said step of obtaining is performed by a base
160 station.

161 42. A method as recited in claim 33, wherein the step of
162 detecting includes performing cyclic error detection.

163 43. A method as recited in claim 33, wherein the step of
164 error detecting includes parity checking.

165 44. A method as recited in claim 33, wherein the step of
166 error detecting includes checksum calculation.

167 45. A method as recited in claim 33, wherein the error
168 threshold level is one part in ten million.

169 46. A method as recited in claim 33, wherein the error
170 threshold level guarantees a satisfactory level of
171 reception of communication data.

172 47. A method as recited in claim 33, wherein the error
173 message is broadcast with a signal having a high
174 probability of reception by the base station in a dead
175 zone.

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176 48. A method as recited in claim 47, wherein the step of
177 broadcasting the error message is at twice the power
178 level of normal message transmission.

179 49. A method as recited in claim 47, wherein the step of
180 broadcasting the error message is via a different
181 transmission channel with a greater probability of
182 reception.

183 50. A method as recited in claim 47, wherein the step of
184 broadcasting the error message is at a lower data rate.

185 51. A method as recited in claim 41, wherein the time
186 when the error occurred is included in an error message
187 from the member to the base station.

188 52. A method as recited in claim 41, wherein the step of
189 reporting includes providing an identity of said at least
190 one of said members.

191 53. A method as recited in claim 33, wherein the step of
192 obtaining includes querying a Global Positioning System
193 to determine the location.

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194 54. A method as recited in claim 33, wherein the step of
195 obtaining includes querying a Loran-C positioning system
196 to determine the members location.

197 55. A method as recited in claim 33, further comprising:

198 said first user entering an error transit mode,

199 said one base station issuing at acknowledge to the first
200 user upon receiving an error message from the first user,
201 and

202 said first user ending the error transmit mode.

203 56. A method as recited in claim 33, wherein the step of
204 broadcasting is repeated a fixed number of times.

205 57. A method as recited in claim 33, wherein the step of
206 broadcasting the error message is repeated over a fixed
207 time interval.

208 58. A method as recited in claim 33, further comprising
209 the step of logging the error message and location, and

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210 the step of broadcasting is delayed for transmittal at a
211 time of low network traffic.

212 59. A method as recited in claim 33, further comprising
213 the step of extracting data from a plurality of error
214 messages and storing the data in a database for future
215 manipulation and/or retrieval.

216 60. A method as recited in claim 33, wherein the
217 database is resident at a network management station.

218 61. A method as recited in claim 33, further comprising
219 the step of replicating the database at at least one
220 other network device.

221 62. A program storage device readable by machine,
222 tangibly embodying a program of instructions executable
223 by the machine to perform method steps for notifying a
224 family of users of a non-operating area of a wireless
225 network, said method steps comprising:

226 providing a database of non-operating areas of the
227 wireless network;

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228 one of the users entering a trip route to a G.P.S.
229 system in the one user's vehicle; and

230 said vehicle querying the database to download the
231 map for dead zones in the trip route.

232 63. A program storage device readable by machine as
233 recited in claim 62, said method steps further comprising
234 recommending a changed route having a reduced area of
235 dead zones.

236 64. A program storage device readable by machine as
237 recited in claim 63, wherein the changed route is shown
238 on a G.P.S. screen in the vehicle.

239 65. A program storage device readable by machine as
240 recited in claim 62, said method steps further comprising
241 providing a warning signal to the user indicating that
242 the vehicle is approaching a dead zone.

243 66. A program storage device readable by machine as
244 recited in claim 62, wherein the warning signal includes
245 an audible alarm.

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246 67. A method for notifying a family of users of dead
247 zones in a wireless network:

248 providing a database of non-operating areas of the
249 wireless network forming dead zones;

250 one of said users entering a trip route into a
251 G.P.S. system within a vehicle; and

252 said vehicle querying the database to download a map
253 showing any dead zones in the trip route.

254 68. A method as recited in claim 67, further comprising
255 recommending a changed route having a reduced area of
256 dead zones.

257 69. A method as recited in claim 68, wherein the
258 changed route is shown on a G.P.S. screen in the vehicle.

259 70. A method as recited in claim 67, further comprising
260 activating a warning signal to the one user when the
261 vehicle is approaching a dead zone.

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262 71. A method as recited in claim 70, wherein the warning
263 signal includes an audible signal.

264 72. A method as recited in claim 67, further comprising
265 the one user making a database query of network reception
266 dead zones, and a network management station responding
267 and determining if the one user is in or near a dead
268 zone, and notifying the one user when the step of
269 determining locates the user in or near a dead zone.

270 73. A method as recited in claim 72, wherein the network
271 management station can inform the user of an appropriate
272 step to take to maintain connectivity.

273 74. An error monitoring and collection system for a
274 mobile network, the system comprising:

275 a plurality of base stations;

276 a plurality of mobile devices wirelessly interconnected
277 with the base stations, each device being a member of the
278 mobile network, each of a subset of said devices
279 including:

280 an error rate monitor to monitor a reception error rate;

281 a message processor to form and report an error
282 message to one of the base stations when the reception
283 error rate rises above a preset threshold.

284 75. A system as recited in claim 74, wherein the error
285 message is used by the one base station to determine an
286 identity of a device reporting the error message and a
287 location of the device at a time when the error occurred.

288 76. A system as recited in claim 75, wherein the base
289 station sends an acknowledgment to take the device out of
290 an error reporting mode.

291 77. A system as recited in claim 74, further comprising
292 a network manager which includes a database that contains
293 records of all error messages.

294 78. A system as recited in claim 77, wherein the network
295 manager includes a network processor to extract recurring
296 error trends.

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297 79. A system as recited in claim 78, wherein the network
298 processor maps areas of network reception dead zones, and
299 responds to a member request querying the data base to
300 determine if the device is entering a dead zone.

301 80. A system as recited in claim 79, wherein the network
302 processor is capable of informing the user of an
303 appropriate action to maintain connectivity.